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Teaming Up? China, India and Brazil and the Issue of Benefit-Sharing from Genetic Resource Use

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Abstract. *Compared to the numerous debates on whether the so-called emerging countries are challenging the existing order, comparatively fewer analyses are on offer about what exactly these countries are attempting to achieve in various global governance fora. In this article, we focus on an area that has not been systematically addressed but is of crucial importance to China, India and Brazil: the global governance of genetic resources. All three countries are rich in biodiversity and, ever since biotechnology promised to turn DNA into gold, have been significant players in the regime complex that governs genetic resources. Shortcomings notwithstanding, the establishment of a new access and benefit-sharing regime constitutes a rare instance where emerging countries have succeeded in becoming rule-makers of sorts. We analyse the ways in which these three countries have sought to pursue their interests in this area, especially after the extension of national sovereignty over previously 'free' genetic resources and the erection of a complex set of rules attempting to regulate access to and benefits from their utilisation from the early 1990s onwards. Despite presenting a generally unified front in international fora, these countries' domestic implementation differs significantly and raises questions about the continuation of a common international position. Alongside other contributions in this special issue, this article adds to our understanding of the nature of emerging countries' engagement with global governance by focusing on the concrete drivers and domestic processes that have motivated and shaped the agency of China, India and Brazil in this new policy regime.*

Introduction

The role played by emerging countries including India, Brazil and more recently China in the intellectual property (IP) regime has been widely discussed in the literature (e.g. Correa 2000; Drahos 1997; Helfer 2004; Kapczynski 2008; Panagariya 2002; Shadlen 2005; Yu 2004). The focus of this body of work has been primarily on contestations on IP and access to health or knowledge following the conclusion of the WTO Agreement on the Trade-Related Aspects of Intellectual Property Rights (TRIPS) in 1994, or on domestic IP legislation. The governance of genetic resources has received comparatively less attention despite it being an area of crucial importance to China, India, Brazil and other developing countries rich in biodiversity. Genetic resources (hereafter GRs) encapsulate material of plant, animal or microbial origin that contains the functional units of heredity which, since the emergence of biotechnology in the 1970s, have become one of the main sources of value creation. With GRs constituting a new source of wealth, conflicts associated with its creation and distribution inevitably followed suit. This was so largely because the opening of this new frontier of wealth creation was simultaneously accompanied by its rapid enclosure through the use of IP titles – e.g. patents on specific gene sequences, plants or entire microorganisms – a process whose fault lines deepened by the concentration of GRs in developing countries and biotechnologies (and associated IP titles) in developed ones.

In an effort to understand the participation of emerging powers in the new benefit-sharing regime that emerged out of these faultlines, we have chosen to focus on China, India and Brazil not merely because they are part of that ubiquitous acronym – BRICS – but because, besides their recent economic performance, they are three of the 17 largest biologically mega-diverse countries (Brazil is the largest).[1] They harbour not only large repositories of GRs and traditional knowledge[2] associated with them, but also considerable ambitions to develop their own biotechnology sectors as a way of capturing part of this new source of wealth. Besides offering this unique combination of large (and growing) markets, ambition and great biodiversity, these countries have for some time been significant players in the regime complex that governs GRs.

A regime complex is understood here as a form of governance characterised by the existence of partially overlapping and often inconsistent regimes with no clear hierarchy between them (Raustiala and Victor 2004). The GR regime complex, for instance, consists of the IP, biodiversity, food, health and trade regimes and includes organisations as diverse as the UN Food and Agriculture Organization (FAO), the Convention on Biological Diversity (CBD), the World Health Organization (WHO), the World Intellectual Property Organization (WIPO) and the World Trade Organization (WTO). This institutional proliferation provides opportunities for domestic bureaucracies in emerging countries (e.g. national intellectual property offices and environmental ministries) to engage internationally and defend particular interests. Sometimes this translates into coherent strategies, making use of one particular institution to advance an agenda and then pursuing it into another (i.e. regime-shifting), but at times also into less coordinated and even contradictory positions held by the same state in different international fora. Not all these fora appear in our analysis, but the existence of this regime complex provides an invaluable opportunity to understand both the nature of the involvement of these emerging countries in global governance fora and how their simultaneous engagement in international and domestic conflicts has shaped their policies regarding GRs governance.

Among the various issues fuelling conflicts over GRs, it was one of the main objectives of the 1992 Convention on Biological Diversity (CBD) – the fair and equitable sharing of benefits arising from the utilisation of GRs – that became the main issue around which a coalition of developing countries coalesced from the late 1990s onwards under the leadership of India, Brazil and, more recently, China. Being fundamentally a distributional and political issue, the seemingly straightforward principle of benefit-sharing from the utilisation of GRs with communities and countries from which they were derived proved fiendishly difficult in practice and it only became important in the GR regime complex due to the persistence and mobilisation of this coalition of developing countries. Their relative success in including access and benefit-sharing (hereafter ABS) rules at the CBD, WIPO and the WHO mimics regime-shifting strategies used earlier by developed countries, especially the now well-known case of shifting

IP negotiations away from WIPO during the 1980s to the GATT/WTO where the TRIPS Agreement emerged (Helfer 2004). For our purposes, the continued efforts of this coalition on this front and its successes so far could be seen to constitute an instance of emerging countries with a comparative advantage in GRs acting as rule-makers rather than rule-takers, at least in this area of global governance.

Instead of simply cataloguing the regime-shifting strategies of the part of India, Brazil and more recently China, we are interested in understanding how these countries are participating and 'making rules' in this contested area of governance through two related lines of enquiry: firstly, we place these more recent contests over the utilisation of GRs in a broader historical context characterised until the early/mid-1980s by strong resistance against the commodification of GRs by most developing countries; and, secondly, we bring into sharper relief the domestic tensions that shape the current position of China, India and Brazil on the issue of GRs utilisation. We argue that, despite their undeniable role in the making of current ABS rules, the 'rule-making' on the part of India, Brazil and (more recently) China does not represent a radical change in this area of global governance. The 'rules of the game' changed radically in the 1980s when the commodification of GRs – in the US first and later in other developed countries – started making its way into various global governance fora, which is why we revisit this historical juncture. Moving our analysis forward, we additionally suggest that despite leading efforts regarding the introduction and implementation of ABS rules in multiple governance fora, important differences in the domestic policies of China, India and Brazil exist and that their participation in this area of global governance cannot be properly understood without attention to these domestic dynamics. Our main argument – and our contribution to understanding the nature of emerging powers' participation in global governance – is that such participation is simultaneously shaped by domestic and global pressures and, more specifically in our case, by the manner in which these states' competitiveness orientation has found expression domestically and internationally in the area of GR utilisation.

The first section starts by looking back at the radical change that occurred to the governance of GRs in the 1980s with the aim of delineating the shift away from the principle of 'common heritage' to that of state sovereignty over GRs. An evaluation of the more recent evolution of the GRs regime complex and its relationship to the IP regime follows. This second section pays particular attention to the efforts of developing countries' coalitions towards creating a robust system of ABS in various international fora during the 2000s. The third section focuses on the key economic and political factors that have influenced domestic and international policies related to GRs utilisation in China, India and Brazil, respectively. Our analysis is based on a multidisciplinary body of work and on interviews with diplomats and policymakers in China, India and Brazil between 2012 and 2014. We are keenly aware of the complexities and different social, political and economic conditions that characterise China, India and Brazil and do not approach our analysis as a standard comparative study. This complexity, and length constraints, necessarily make our analysis non-exhaustive. We are also aware that our focus on the state and its actions in this area of governance overshadows the agency of international organisations and domestic non-state actors; to rectify this shortcoming somewhat, we refer to the latter and their interplay with various state actors in the specific country-sections, as and when they are important. It is our hope that the article, and its limitations, will offer a first step towards understanding what underpins these countries' participation in the GRs regime complex and towards broadening attention to this issue in future research.

1. Emerging countries and the evolution of the regime complex governing GRs access and benefit-sharing

Far from resolving the matter, the principle of sharing fairly the benefits arising from the utilisation of GRs enshrined in the CBD ushered in an era of contests over how access to GRs – most of which are located in the developing world – and benefits from their use should be managed and apportioned in practice. As will be seen, in time these contests succeded in generating a set of access and benefit-sharing (ABS) rules at the international and national level,

but as far as many developing countries are concerned the work is far from over. Of the most important recent efforts, for instance, are those led by India, Brazil and China to reconcile TRIPS and the CBD through amending the former so that the origin of GRs utilised to develop a product/process that is patented is obligatorily disclosed with a view to making benefit-sharing possible and effective. The intensity of the debates at the WTO TRIPS Council over this issue can obfuscate the fact that these efforts do not represent the first instance when developing countries have engaged in contests over IP protection and GRs. The CBD and TRIPS themselves represent the outcome of previous contestations over issues related to access to GRs and technology whose roots go back at least to the 1950s.[3] It was during this period that the newly independent states simultaneously committed themselves to adhering to inherited IP laws as a 'duty' of statehood, embraced the concept of GRs as 'common heritage of humankind' and continued to nurture a strong sense of their genetic patrimony – and much else besides – having been looted during colonisation (Okediji 2013; Chatterjee-Miller 2014). These contradictory pulls would go on to have significant repercussions on how the issue of GRs and IP would be contested from then onwards, including the current conflicts over TRIPS and the CBD.

The decolonisation process led not only to the expansion of newly-independent states' ranks, but also to their political mobilisation in international policy regimes bringing into the fold issues related to GRs and IP rules as part of a movement for a New International Economic Order (Murphy 1983). Partly because these issues fell under the remit of different regimes, and partly because biotechnology had yet to emerge as the new profitable technological frontier, the articulation of demands over GRs and IP followed somewhat separate trajectories. On the one hand, calls for a fairer international IP regime – led by India and Brazil – focused on reforming the Berne and Paris Conventions (on copyright and patents) at WIPO to enhance the flow of knowledge and technology from frontier to developing countries (Braithwaite and Drahos 2000). On the other hand, calls for a fairer regime for GRs became more pressing at the FAO during the 1970s as developing countries saw their own plant GRs, often accessed freely,

increasingly penetrate their markets as commodities, largely in the form of hybrid plant varieties developed in the more economically-advanced countries (Mooney 1983).

The latter phenomenon was the outcome of a number of complex developments, especially of the emergence of seed hybridisation as the technology of choice in frontier economies during the early 1900s – and through the Green Revolution, in much of the developing world – and related institutional arrangements in the US and most Western European states. These eventually resulted in a hierarchy of 'elite' and 'primitive' plant GRs, the former including modified and hybrid varieties protected by private intellectual property rights (e.g. private breeders rights), whereas the latter were seen as 'raw' plant forms that, conversely, continued to be considered the 'common heritage of humankind' (Kloppenburg 1988). Pressure applied on developing countries by the more advanced counterparts to both guarantee access to 'raw' GRs as 'common heritage' and to adopt private plant breeder rights, led to demands by developing countries that FAO prepare a binding international agreement to regulate the flow of GRs in 1981. A meagre and, as it turned out, temporary victory appeared to have been achieved in the voluntary 1983 FAO International Undertaking on Plant Genetic Resources that confirmed the principle that plant GRs were a heritage of mankind and expanded it to include the 'elite' commercial cultivars developed in economically-advanved countries (Mooney 1983). But this success was only one moment in broader transformations that would simultaneously heighten contests over GR and bring them head to head with concomitant contests over IP rules over the next decade: ten years later, the CBD had been agreed and TRIPS followed. Neither mentioned the 'common heritage' principle and both confirmed that GRs were to be regulated as *commodities* (Cimoli, *et. al* 2008). Indeed, many of the developing countries that had rejoiced in the 1983 FAO Undertaking either pushed for or agreed during CBD negotiations that GRs were commodities whose ownership rested emphatically not with humanity, but with them.

The shift from the 'common heritage' principle to that of states' sovereignty over GRs was not the result of negotiation fatigue or miscalculation. Rather, it must be understood in the context of wider transformations taking place in the global economy during the 1970s and 1980s that exacerbated (developed and developing) states' preoccupation with their participation and competitive position in world markets. As states started to shift their attention towards international competitiveness, they found themselves engaged in increasingly more intense conflicts in international policy regimes where the 'rules of the game' are made and remade (Jessop 2014), including those over IP and GRs. What is specific about this new context is not only the reorientation of states' role towards competitiveness, but also the heightened valorisation of nature which was facilitated by the emergence of biotechnology in the late 1970s as a new and promising technological frontier (Smith 2007). Competitive pressures emanating from economic and institutional changes aimed at the commercialisation of biotechnology in the US from the late 1970s onwards forced other developed and ambitious developing states to do the same in an effort to capture part of the economic value created by the opening of this new technological frontier.

While achieving this goal was complex in its own right, developing countries rich in biodiversity had to deal with an added difficulty that would shape their engagement with the global governance of IP and GRs. Although changes to patent rules (initially) in the US had transformed the information contained in DNA sequences into a strategic commodity that patents were to protect, the success of biotechnology still depended on continued *access* to GRs that were concentrated in what came to be known as mega-diverse countries, some of the largest being Brazil, China and India. Not only are these three states rich in biodiversity but they had also willingly embraced the competitiveness orientation from the mid/late 1980s onwards (Muzaka 2018). As such, the promise of biotechnology became irresistible to them. Rich in genetic resources and preoccupied with improving their chances of economic growth and competitiveness in world markets made upholding the principle of 'common heritage' untenable, and the development of their own biotech sectors a key priority.

This new orientation shaped their participation in the CBD negotiations and, partly as a result, the CBD makes no mention of the 'common heritage' principle but rather considers GRs as valuable resources. Indeed, this shift had been in the making prior to CBD negotiations: the 1983 FAO Undertaking was strongly opposed by developed countries who saw its inclusion of 'elite' commercial cultivars as part of 'common heritage' threating to the competitive advantage of their plant breeding and agribusiness sectors (Bordwin 1985; Kloppenburg & Kleinman 1987), leading to contests over its interpretation that only abated when three resolutions were agreed in 1989 and 1991.[4] Attracting hardly any attention, they nonetheless signalled a significant shift: all states, including key developing ones, recognised sovereign rights over their GRs, while simultaneously recognising the private rights of commercial plant breeders (Kloppenburg 2004; Safrin 2004). The CBD simply reinforced this dual property regime and brought genetic diversity indisputably under the custodianship of the state guided by the principle of *utilitarian conservation*: the CBD does not restrict access to what is to be protected but instead facilitates access and use (Brand & Görg 2013). What is important for our purposes it that because both TRIPs and the CBD are based on an understanding that GRs are economically valuable resources, developing countries' efforts to reconcile the two are not over incompatible principles but primarily over the concrete ways GRs are to be utilised nationally and globally, that is, who should have access to them and their derivatives, under what terms and toward what ends.

More specifically, efforts on the part of China, India and Brazil to change the domestic and international rules on GRs utilisation are directed both towards enhancing their chances of economic growth and competitiveness, and managing the tensions that this orientation creates between various social groups. For example, rules such as prior informed consent, benefit-sharing and certificate of origin for patenting purposes represent not only efforts to gain economic rents from GRs, but also to manage tensions between bio-prospectors and various traditional, indigenous and other domestic groups. Because all states are simultaneously shaped

by conflicts from outside and from within (Cumings 1999; Jessop 2002), our analysis seeks to include in its focus the various groups involved in contests over GRs domestically and internationally although, as noticed earlier, the level of analysis adopted limits somewhat the space needed to do these groups' involvement full justice. Although they are inseparable in practice, for analytical purposes we turn to the efforts of China, India and Brazil in demanding the codification of access and benefit sharing (ABS) rules in international fora in the next section, before turning to their domestic measures in the following one.

2. Regime shifting and the emergence of an incipient international ABS system

With the CBD and TRIPS entering into force in December 1993 and January 1995 respectively, the stage was set for contests over ABS to emerge and engulf not only the CBD and the WTO, but also the WIPO, FAO, WHO and the UN Environmental Programme (UNEP).[5] The principle of adequately compensating providers for the use of their GRs – what became known as the ABS principle – was established in the CBD, but had no place in TRIPS. The latter demanded all its signatories (most of which are CBD signatories) to introduce patent protection in all areas of technology, i.e. including biotechnology. Attempts to solve the power imbalances between GRs users (mainly companies from developed countries) and GRs providers (mainly developing countries) led developing countries to coalesce around groups such as the Like-Minded Megadiverse Countries (LMMC), the Like-Minded Asia-Pacific Countries (LMAC), the Group of Latin American and Caribbean Countries (LACC), the African Group (AG) and the G77 + China. India and Brazil were at the forefront of these efforts since the start; China, for reasons that will become clearer in the next section, showed an interest on the issue of GRs and associated traditional knowledge (hereafter TK) later.

As early as 1996 India raised concerns about the relation between the two agreements at the WTO and UNEP, and since the 1999 WTO Seattle Ministerial reconciling the two on the matter of GRs utilisation became one of the main issues contested at the TRIPS Council.[6] At the same

time, the issue was also raised by developing countries at WIPO, leading to the establishment of the Intergovernmental Committee on Intellectual Property, Genetic Resources, Traditional Knowledge and Folklore (hereafter WIPO IGC) in 2000. During the following 16 years, various coalitions of developing countries led by India and Brazil would shuttle primarily between the WTO, WIPO and CBD in order to achieve what had emerged since the late 1990s as their preferred approach of reconciling TRIPS and CBD: a legally-binding international instrument that would put the burden on GRs *users* to ensure that resources had been legally acquired in consultation with the relevant communities and provider state authorities, and under mutually-agreed terms that included specific arrangements about how benefits from GRs utilisation would be shared with them.

The WTO TRIPS Council became the primary focus of such efforts because of all international fora involved in GRs governance, the WTO is the only one with a binding dispute settlement mechanism. Apart from being legally-binding, TRIPS came with a built-in agenda that included the review of Article 27.3(b), an article which, due to disagreements during negotiations, had carved out several exceptions to biotech patenting, namely the permission to exclude plant, animals and other higher life forms from patenting. That large and ambitious developing countries were not rule-makers at this point became clear as soon as the review process started in 1996. Although the opportunity existed to shape the norm of 'life-patenting' – still at this point a new and by no means widely accepted norm at the international level – India and Brazil focused instead on reconciling TRIPS and CBD along the lines mentioned above: specifically, through amending TRIPS Article 27.3 or Article 29 (on patent disclosure requirements) to secure an effective international ABS system to accompany the utilisation and patenting of GRs, i.e. to secure rents from GRs in their territories. Because mandatory disclosure had already been discussed during domestic debates in the 1990s (Anadhura et al. 2001), India (and soon thereafter Brazil) became the main proponents of reconciling TRIPS and CBD through amending Art. 29 of TRIPS to include mandatory disclosure of origin and prior informed consent as criteria for the patentability of innovations based on GRs.[7]

Immediately labelled 'the fourth patentability criteria',[8] the mandatory disclosure proposal was opposed by the US and other developed countries (e.g. Canada, Australia and Japan) and remains so to this day. Encouraged by the turn of events that led to the new WTO Doha Round launched as a 'developmental round' in 2001 and their success on the IP-access to medicines front that same year (Muzaka 2011), developing countries concentrated their efforts at the TRIPS Council and ABS negotiations at the CBD.[9] Of the latter, negotiations over the Nagoya Protocol were particularly difficult and agreement was only achieved under intense pressure and fear of credibility-loss in case of non-agreement.[10] Although the 2010 Nagoya Protocol provided more clarity on how the hitherto vague CBD objective of ensuring fair sharing of benefits from GRs use was to be achieved, it left many developing countries unsatisfied. Ultimately, the Protocol put the ball back into the national governments' court, asking them to set domestic ABS legislation regarding the terms of access to GRs, benefit-sharing, prior consent rules and so on.[11] Part of the reason for this dissatisfaction was that efforts on the part of some developing countries led by India and Brazil to name patent offices as mandatory national checkpoints to capture non-compliance with ABS rules of user and provider countries – a strategy they had followed in parallel to amending TRIPS along the lines mentioned earlier – were unsuccessful.

Deflated by the Nagoya outcome and with the successful completion of the WTO Doha Round appearing increasingly unlikely by 2010, developing countries' coalitions on ABS and GRs renewed their efforts at the WIPO IGC. Until then, the Committee's work had progressed somewhat on issues related to TK and folklore, but lagged behind on issues related to GRs. Developed countries, the US key among them, opposed a mandatory requirement mechanism while developing countries, led by India and Brazil, insisted on it.[12] IGC's decade-long work on GRs had generated a number of technical analyses of mandatory disclosure requirements, draft IP guidelines for ABS and draft patent examination guidelines with a view to preventing erroneously granted patents and ensuring compliance with ABS rules. But as the new decade

opened, developing countries started to argue that time had come for a diplomatic conference to be convened by WIPO towards concluding a legal instrument for the protection of GRs and TK, including the mandatory disclosure mechanism as the preferred means of ensuring compliance with incipient national and international ABS rules. Initially envisaged for 2012,[13] the deadline has repeatedly moved forward due to lack of consensus and, for the moment, it will be considered again by the WIPO General Assembly in September 2019.[14]

This avenue may prove more successful, not least because some developed countries (e.g. Switzerland, Norway and to a lesser extent the EU) have shown more flexibility towards demands by developing countries on the homologation of TRIPS and the CBD. Moreover, as a longstanding participant in these debates observed,[15] large developing countries started shifting their approach towards GRs utilisation by the time the Nagoya Protocol was concluded towards facilitating user countries' access, not least because they had become user countries themselves. Perhaps the most important reason why this avenue may bear some fruit is the change in China's position at WIPO. China's interest in supporting and internationalising its traditional medicine sector and a number of cases of misappropriation of Chinese TK explains why "China felt threatened and decided to join the coalition… This is very interesting as during WIPO negotiations China was never aggressive. On the Intergovernmental Committee, China was always removed. So, in a way they were free riding, but now they have changed their position and this matters because of their weight".[16]

While the outcomes of the WIPO IGC process remain to be seen, developing countries, and India and Brazil in particular, continue to push for an effective ABS system based on the mandatory disclosure of GRs' origin at the TRIPS Council and at the CBD meetings. Although they have not achieved this goal yet – given the complexity of the international regime governing GRs and, as we shall see, multiple and conflicting domestic demands – the emergence of an international ABS system and the widespread recognition of the need for its improvement are not small feats. Their success on this front in the future will depend on their

ability to maintain strong coalitions among themselves and with other developing countries, as well as their ability to resolve their domestic conflicts over the use of GRs.

3. GR governance and ABS rules in China, India and Brazil

China

Of Deng Xiaoping's much-discussed reform programme (1978-1989), the most relevant to our discussion are changes to China's legal and institutional framework, and its approach to the then-emerging biotechnology. Mao's legacy in China's legal system had been the nullification of earlier legal modernisation reforms, hence Deng's efforts to introduce anew a whole raft of laws, including environmental regulation and IP laws (Cheung 2009). This legal vacuum and China's absence in international environmental and IP fora were addressed relatively rapidly during the reform period; among the first countries to ratify the CBD, China also joined most international conventions on biodiversity and introduced domestic biodiversity-related laws. Additionally, it built a national IP regime – under intense pressure from the US – in the run-up to its WTO entry in 2001 (McBeath and Tse-Kang 2006; Serrano 2016). The broader aim of Deng's legal and institutional reforms was the establishment of a more predictable administrative legal framework capable of rationalising governance, enhancing administrative efficiency and reining in local governments (Peerenboom 2002; 2004). The latter issue has by no means been resolved; it is well-known that the relationship between the Communist Party, the central and local governments continues to generate internal conflicts that, in turn, have had implications on China's approach to GRs governance and ABS rules.

Deng's reforms were also meant to build the institutional framework that his Four Modernisations strategy – modernisation of agriculture, industry, science and technology, and defence – needed to succeed. Science was to provide the route to 'socialism with Chinese characteristics', thanks to a small group of scientists having succeed in persuading Deng that major investments were vital to the success of the Four Modernisations strategy (Keeley 2005).

The aim of the ensuing 863 National High-Tech Programme established in 1986 was to enable China to co-opt the new sciences before they came to be dominated by the West and especially the US. Biotechnology headed the list of priority areas: the double-helix became the symbol of China's high-tech drive and the development of the Chinese biotech sector an integral part of its modernisation vision (Smith 2000). That this commitment remains strong is clear in data indicating that nearly 20 percent of the total science and technology investment goes to research in the life sciences and biotechnology (Chen *et al.* 2007). Moreover, overall spending in R&D has increased to over two percent of GDP – double that of India and Brazil – making China's R&D spending in absolute terms second only to the US (Ni 2015).

Despite a more ambiguous picture on the ground, China's biotechnology revolution is generally held as a remarkable example of what its targeting of a priority area supported by a strong network of policymakers and scientists – and, importantly, generous public R&D investment – can achieve. Indeed, China is often singled out on account of it having developed the largest plant biotechnology capacity outside North America (Huang *et al.* 2002; Chen et al. 2007). In the late 1990s, the Chinese government was already investing over US$100 million on plant biotechnology annually, ten times the total investment (public and private) in Brazil and five times that in India (Huang *et al.* 2002: 675). Such levels are important, but so too is recognising an idiosyncratic element of China's approach to plant biotech: the state's tight control not only over China's GRs, but also of its plant breeding programme and, more broadly, of its biotech sector overall. State control over GRs in fact predates the CBD and derives from land ownership rights established during Mao's land reform of the early 1950s and the more recent 1998 reform of the communal system (The Economist 2013). Given that it enshrined the sovereign right over GRs in a nation's territory, the CBD ratification in 1993 posed no difficulties for China (McBeath & Tse-Kang 2006), not to mention the fact that the CBD placed no burdensome obligations to preserve biodiversity on its members.

The FAO International Treaty on Plant Genetic Resources for Food and Agriculture of 2001, however, clashed significantly with China's approach to plant GRs. Unlike India and Brazil that were driving the negotiations, China has not yet become a party because, unlike the CBD, it provides multilateral access to a wide repository of agricultural GRs which in China are considered strategic resources controlled tightly by the state. These agricultural GRs are not generally available to private breeders; other countries can only access them on the basis of specific agreements that define the purpose of use, IP, ABS rules and other matters (Zhang 2012). So embedded are concerns of preserving self-sufficiency and food security that the development of an indigenous agricultural biotech was prioritised under the 863 Programme since the start because the control of the seed and plant breeding industry by foreign companies was seen as a danger of a higher magnitude than that posed by advanced weaponry (Keeley 2005: 159). As noted, unlike India and Brazil, the state not only accounts for nearly all of China's plant biotech research expenditure, but the vast majority of the biotech sector is also under its control. The entry of transnational life-science companies is not altogether forbidden but rather managed with a view to developing biotech R&D capacities and always in partnerships with a Chinese partner, e.g. the Chinese Academy of Sciences, the Chinese Academy of Agricultural Sciences, or state-owned enterprises at the national or local level.[17]

Apart from agricultural biotech, another sector to which the Chinese state has devoted significant resources is drug development based on traditional Chinese medicine. Systematic efforts to modernise traditional medicine production and to internationalise this sector have been accompanied by R&D investment that have led to several novel drugs (Chen *et al*. 2007). The best-known have been an anti-malaria drug derived from artemisinin[18] and alkaloids isolated from Chinese herbal medicine for Alzheimers, developments which, in turn, led to increased state investment in the sector. Like agri-biotech, the modern-traditional medicine sector has become "a pillar of [China's] new innovation-driven economic growth model" (FT 2015). The expected contribution of this sector has only served to heighten the importance of control over GRs to the Chinese government. Likewise, evidence of cases of misappropriation

of GRs related to traditional Chinese medicines and TK associated with them contributed to the Chinese state taking a rather more proactive role internationally. Cases of misappropriation included Harvard University's collection of large blood samples in the Anhui Province (Xue 2005), research on active ingredients found in traditional Chinese medicine by foreign companies (Torri & Herrmann 2011), and, perhaps more importantly, the granting of over 150 patents to non-Chinese entities on 23 of the most commonly used Chinese medicinal plants around the world (Wu et al. 2013). An assertive China on issues of GR utilisation and ABS rules was no longer news as the first decade of 2000s was coming to a close.[19]

The governance of GRs in China has not been simply 'statist', but also fragmented and characterised by competition between diverse local and central interest groups. These characteristics provide some insights towards explaining China's recent international shift on GRs and ABS issues. The case of the CBD Nagoya Protocol is particularly instructive. During the Protocol negotiations, the Chinese delegation played largely an observing role and practically never took any initiative.[20] Even after the Nagoya Protocol was concluded, ratification at home was effectively blocked due to conflicting interests and overlapping competences of different ministries (Zhang 2012). To give an idea of the magnitude of this challenge, the National Committee for Biodiversity Conservation – the top decision making body on biodiversity – consists of 26 different ministries. In addition, the Ministry of Environmental Protection is a very recent creation, having replaced the lower-ranking State Environmental Protection Agency only in 2008. Large and more established Ministries (e.g. Agriculture, Commerce, Foreign Affairs and the National Development and Reform Commission) with high stakes on GRs have made reaching consensus over the Nagoya Protocol a difficult task (Czarnezki and Yu 2013).

Conflict and competition is not only inter-ministerial, but takes place also between central and local actors. This fragmented and conflictual polity, alongside the use of experimentation and pilot-projects so characteristic of Chinese governance, have seen the emergence of a number of

initiatives related to GRs and ABS on the ground. Collective land rights, for instance, have made possible innovative forms of agreement to share GRs benefits through a community fund (Vernooy & Ruiz 2013: 108). Geographical Indications[21] have been used to further collective production and benefit sharing as in the case of waxy maize in Guanxi province. A series of National Pilot Projects for IP Protection of TK were launched in 2008 covering 15 counties, municipalities or regions, e.g. the Hubei and Sichuan provinces (Cabrera Medaglia *et al.* 2014). Other approaches have been tried, including private-public partnerships; e.g. the Foreign Economic Cooperation Office has promoted biodiversity conservation cooperation between local governments and the private sector in coastal areas such as Shanghai, Jiangsu and Zhejiang, where numerous export-oriented companies are nominally interested in corporate social responsibility projects.[22] This incipient ABS system no doubt prepared the ground for the eventual ratification of the Nagoya Protocol, but it would be difficult to ascertain when this would have occurred had it not been for a strong push by the central government in mid-2016. China ratified Nagoya in June 2016 so that it would come into effect by the time it hosted the G20 summit in Hangzhou in September, when it also reached the bilateral agreement with the US on climate change that opened the way to the Paris climate change deal in the same year. The Nagoya ratification, then, was the result of a broader shift towards international activism on climate change on the part of the current Xi Jinping's administration, which has also launched numerous environmental reforms to achieve what it calls 'ecological civilization'.[23]

Challenges related to the Nagoya Protocol were largely domestic, but rather than arising from societal forces, they reflected the particularities of the Chinese polity and the institutional shifts that have taken place since the reform period. As noted, the adoption of the Protocol – the most advanced international instrument on ABS to date – was the result of a number of such shifts, especially of growing state concern over GRs misappropriation and its ambition to support its biotech and traditional medicine sector, both of which led to decisive action on the part of the central government to ratify the Protocol even if belatedly. Underneath these broader concerns, others were and continue to be raised and pushed by different actors: far from a monolith, the

Chinese state is a collection of competing ministries, diverse local and national interests based on strong informal links with a dynamic form of private networked capitalism, sometimes called Sino-Capitalism (McNally 2012). This political economy also allows for a large degree of experimentation and cut-throat competition which goes some way towards explaining inaction in some fronts and, simultaneously, the development of innovative forms of benefit-sharing which in time found their way into an incipient national ABS legislation that eventually prepared the ground for China's more assertive participation in international ABS contests.

India

One of the issues on which governments of various political orientations in post-1991 India have unanimously agreed is that the development of the biotech sector is in India's national interest. Almost unanimously, Indian policymakers have come to see biotech as a 'technology of hope', a powerful enabling technology that would not only revolutionise agriculture and health in India, but also help establish it as a knowledge superpower in the world (Newell 2003; GoI 2007). Although this vision would come to the fore from the 1990s onwards, the Indian state had paid close attention to developments in biotechnology and IP trends in the US and other developed economies throughout the 1970s and 1980s. It responded to such developments relatively rapidly: it included biotech as a new priority area in its 6th Five Year Plan (1980-85), set up the National Biotechnology Board in 1982 and established the Long-Term Plan in Biotechnology of 1983 (Kumar *et al.* 2004). Significant public investments in the biotech sector followed: e.g. investment in human and physical infrastructure, financing direct R&D in public labs and universities, creating technology and science parks, offering tax breaks and other measures to push businesses and public scientists towards biotech innovation and commercialisation (Mueller 2008). Considerable public investment in this emerging sector was consistent with substantial investments made earlier in 'big science' and high-tech sectors; they were unusually high for a country with relatively high poverty and illiteracy rates, but the Indian state saw such measures then, and now, as central to improving India's economic fortunes and its rise to greater global prominence (Alamgir 2009). Its early orientation towards the

development and commercialisation of biotechnology, alongside its wealth of biodiversity underpinned India's reservations about the 'common heritage of mankind' principle during the mid-1980s and its decisive move towards the principle of national ownership from then onwards (Rajan 1994).

Unlike China, the commitment to create a competitive Indian biotech sector had to contend since the start with an increasingly stronger environmental movement that included concerns about the looting of India's biological diversity during colonisation and after (Krishanswamy 2011; Nayar 2015). In this charged domestic context, the CBD negotiations during the 1980s and early 1990s offered the Indian state an opportunity to pursue a simultaneously assertive and defensive strategy: to deal with the issue of biodiversity that, as Indian environmental groups had been arguing at least since the early 1980s, required protection from new forms of misappropriation (e.g. biopiracy), and to pursue more assertive goals. The latter included demands that access to GRs be made conditional upon the transfer of technologies developed by biotech companies in advanced economies in line with its aim of developing an indigenous biotech sector in India (Rajan 1994).

Although Indian polity is very different to the Chinese one, it is remarkable that India's new orientation towards a more open and competitive economy – starting with internal liberalisation reforms during the 1980s and including cautious external liberalisation reforms from the 1990s onwards – was an 'elite coup' led by a powerful executive-technocratic elite within the state that played a fundamental role in formulating and pushing the reform process forward from behind the scenes (Mukherji 2012; Kohli 2006).[24] Importantly for our purposes, the break with the past orientation was based in no small measure on the hope that the scientific, technological and industrial capacities developed until then would provide the basis on which to compete in high-tech sectors in world markets. Bound into the vision of India becoming a competitive knowledge economy was the reform of the Indian IP and biodiversity regime so as to enable *Indian* firms to compete and succeed in world markets.

In line with this orientation, India adopted an offensive-defensive GRs strategy aimed simultaneously at resisting acts of biopiracy fueled by a nationalist indignation against neocolonial expropriation, and at becoming a competitive player in global biotech markets itself (Rajan 2006). Steadfast in its resolve to convert India's biodiversity "into economic wealth for the country" (Dutfield 2004: 175), the Indian state acted to defend the GRs now firmly under its control: in two highly-publicised cases, it challenged patents issued by the US patent office on turmeric and basmati rice and succeeded in their revocation or limitation in 1997 and 2001 respectively, a move that besides boosting its anticolonial credentials at home also strengthened the case for more 'robust' IP laws in India so as to protect Indian TK and GRs. These efforts were accompanied by a state-run Traditional Knowledge Digital Library, a library documenting TK across India since 2001 and currently running to over 30 million pages (Krishanswamy 2011). In parallel, the Indian state negotiated deals with foreign patent offices granting them access to such records for examination purposes, while, as discussed earlier, taking a leading role in international GRs contests demanding that TRIPS and the CBD are linked via an international and legally-binding disclosure of origin regime for GRs.

The tensions inherent in simultaneously protecting GRs and becoming a global biotech power became apparent in efforts to modify the domestic IP system – meant to turn India's intellectual prowess into wealth (Drahos 2010) – and were particularly visible in 2002. In this year, the Indian state approved the first genetically-modified (GM) seed despite a very strong anti-GM civil society campaign (Newell 2003; Ramanna 2006). This watershed decision was accompanied by two no less important acts: the Biodiversity Act enacting the CBD, and a new amendment to the patent law. The latter prohibited the patenting of TK and requested that patent applications disclosed the origin of relevant GRs – making India among the earliest adopters of this means of linking IP and biodiversity laws – but at the same time it also brought microorganisms and biotech processes within the remit of patentable matter. This expansion of patentability was in line with the government's position that biotech patenting is indispensable

to the development of India's biotech sector, a position at odds with India' socio-cultural tradition that opposes 'life-patenting' (Scoones 2002; Rajan 2006). Like all amendments to India's IP regime proposed by the government since the mid-1990s, this act was fiercely opposed by civil society groups and, although supported by key departments, e.g. the Department of Industrial Policy, the Council for Scientific and Industrial Research (CSIR), the Department of Biotechnology, the Ministry of Science and Technology and that of Agriculture, it was also opposed by other state agencies, most notably the Ministry of Environment and that of Health (Muzaka 2017). Resistance was partly overcome through an agreement to consider civil society groups' requests to narrow the scope of microorganism – which TRIPS does not define – by an expert group that eventually ruled it as inconsistent with TRIPS in 2007 and again in 2009 (Mueller 2008; Basheer 2009).

That this decision had much to do with the importance the Indian government attached to the development of a modern biotech sector – and the role of IP protection in it – is evident not only in continued support for the sector, but also in the fact that public agencies have emerged as the most aggressive market players in it. In a sector characterised by a large number of private companies, it is worthy of note that the most prolific domestic patent-holders are not Indian private companies, but rather government departments, state-owned companies and public research laboratories, most notably CSIR, incidentally, one of the largest public research networks in the world (Rajan 2005; Dutz 2007). Although the 2002 patent amendment act made TK non-patentable, many such patents have been granted to public laboratories and, in the case of the modern-traditional Auyverdic medicine sector, to Indian private companies, too (Pordié & Gaudillière 2014). The 2002 Geographical Indications Act, officially justified to prevent the misappropriation of products developed over time by local communities (e.g. basmati, Darjeeling tea), proved no different: by the end of the 2000s, most of the nearly 130 GIs issued were registered by a state department or agency (Krishnaswamy 2011).

In addition to the state's appropriation of IP titles over India's GRs, control over them was further secured in the 2002 Biodiversity Act which, as the CBD it was implementing, placed no obstacles to their commodification. Notably, it set up a system to police access to genetic material on the part of foreigners, suggesting that the problem was not the appropriation of GRs *per se*, but rather its beneficiaries. At the helm of the system controlling access to GRs stands the National Biodiversity Board, an agency of a state with a poor record of protecting the rights of traditional/indigenous communities (Randeria 2007). As a matter of fact, the 2002 Biodiversity Act does worse than the CBD in recognising these rights: despite going through a decade-long process of activism on the part of civil society and although a three-tier structure was enshrined in the Act giving local communities a role to play in biodiversity management, they have yet to play such role. Indeed, of over 300 cases approved by the Board by the late 2000s, no cases of benefit-sharing with local communities had been concluded, nor had they been properly involved in the approval process (Kohli *et al.* 2009).

Having already enacted the CBD and set up a domestic regime to regulate access to GRs along the general lines discussed here and pushing for the same in international fora, the Indian state had no difficulty in ratifying the Nagoya Protocol in 2012, one of the first countries to do so. The Protocol, like the CBD, is framed in India as a means of halting the exploitation of its GRs by foreigners and, as noted, it defers to national GRs and ABS legislation which India had already set in place. When it announced the ratification, the Environment Minister boasted that India had "a great deal to offer to the world in terms of … protecting biodiversity with the active participation of the local communities" (Natarajan, quoted in Suchitra 2012). As discussed, local communities are not the protagonists of India's approach to GRs. Despite active opposition at home, this approach has been primarily shaped by the unwavering commitment of the Indian state to the development of a biotech sector capable of competing in global markets (Muzaka 2018). This ambition, coupled with a pronounced sensibility related to neocolonialism and strong nationalist sentiments, continues to shape India's current efforts in international GRs contests.

Brazil

Brazil was the first country to ratify the CBD in 1994, signalling an important shift in orientation towards international environmental issues during the mid-1980s. Only a decade earlier, the Brazilian military government had made it clear at the UN Conference on Environment in Stockholm that it regarded calls to preserve the Amazon rainforest as attacks on Brazil's sovereignty (Keck 2002). If earlier international environmental concerns were invariably framed as a renewed foreign ploy to take control over the Amazon, Brazil's economic crisis and the democratisation of its political and social structures during the 1980s generated a long-lasting shift in Brazilian discourse on the sustainable use of natural resources, the most visible sign of which was Brazil playing host to the Earth Summit in 1992 from where the CBD emerged (Garfied 2013). At the same time, not unlike in China and India, the civilian government had by the late 1980s determined that Brazil's new growth strategy was to be based on the competitive insertion of its economy in world markets, a strategy that strongly emphasised the application of science, technology and innovation in high-tech sectors (Pedersen 2008; Leiva 2008). Despite this emphasis, and having one of the largest reserves of biodiversity in the world, biotechnology became a sector of special significance only in the early 2000s. Following the neoliberal reforms of the 1990s, the return to industrial policy in the early 2000s highlighted the biotech sector as a 'gateway to the future' and a 'frontier technology' (PITCE 2003), followed by increased state support for the sector which consolidated further with the launch of the Biotechnology Development Policy in 2007.

Although systematically supported since the early 2000s, the state's involvement in the sector has a much longer history, as visible in the successful Brazilian Agricultural Research Corporation (Embrapa) established in 1973 and the 1975 *ProÁlcool* Programme that would eventually contribute to Brazil becoming a key player in the world biofuels market (Nastari 1983; Nehring 2016). Following the emergence of the modern biotech sector in developed economies, the Brazilian state responded by including biotechnology as one of the key sectors

in its Programme for Scientific and Technological Development during the 1985-1995 period, but funds were hard to come by in the aftermath of the debt crisis. Nonetheless, a significant research infrastructure was already in place in Brazil and, importantly, in the Amazon thanks to the persistence of a small group of Brazilian scientists and conservationists who had convinced consecutive governments of the potential importance of the Amazon's resources for the biotechnology and pharmaceutical sectors (Garfield 2013). As the vision of Brazil becoming 'the great biotech and environmental power of the 21st century' took shape during the 2000s (e.g. Lula 2007), efforts towards supporting the biotech sector multiplied, as did public financing and programmes and agencies aimed at transforming the Amazon's biodiversity into high value-added products (Coutinho *et al.* 2001; Bound 2008).

Following the ratification of the CBD – and in line with its 'conservation through utilisation' approach – a number of projects were initiated primarily in the Amazon basin during the 1990s. They generated hardly any economic benefits but plenty of headaches for the Brazilian state. One particularly problematic front emerged in the form of indigenous communities' resistance against such projects taking place without their consent during the Cardoso administrations (1995-2002) (Eimer *et al.* 2016), not to mention the fact that many (but not all) consider the idea of GRs commercialisation as incompatible with their traditions.[25] Just as the discourse on the environment changed during the 1980s, that on indigenous communities living in the Amazon changed, too: often seen as a hindrance to the country's development, they now emerged as defenders of the national biogenetic patrimony and as a fountain of knowledge that could propel Brazil into knowledge economy status (Conklin 2002). This new-found status was not only discursive, but also legal. Although the CBD vested states with ultimate control over GRs, the new 1988 Constitution considered GRs as a component of the environment and thus as a collective good, while also recognising indigenous communities' prior land rights and ownership of TK associated with GRs (Gross 2014).

A second front of resistance reinforcing the first emerged in the form of legal proposals on CBD's implementation that sought to make its optional endorsement of indigenous groups' consent into a mandatory requirement. The most influential of these was made in 1995 by Congresswoman Marina Silva – a notable environmental figure in Brazil – followed by even further-reaching proposals by PT (Workers Party) representatives (Velez 2010). Such proposals clashed with Cardoso's aim of preserving the Executive's powers over this matter, but although all state agencies agreed that GRs should be utilised towards economic goals, the degree of indigenous communities' involvement was strongly disputed and supported primarily by the Ministry of the Environment and the Public Prosecutor's Office (Eimer *et al.* 2016). It is difficult to evaluate how long this turf war would have lasted. Due to widespread anger about the plundering of Brazil's biodiversity that erupted on evidence of an unfavourable contract signed between a public agency and a foreign pharmaceutical company,[26] Cardoso was forced to issue a Provisional Measure in 2000 which effectively implemented the CBD and, through numerous resolutions, ushered in an ABS system in Brazil.

The Council for Managing Genetic Patrimony (CGEN) – a body involving 19 ministries and federal institutions – took control over access to GRs in 2002, marking the point in time when various groups, key amongst them Brazilian scientists, started criticising the state's 'heavy-handed' approach towards GRs as contributing to Brazil's loss of competitiveness (Biominas 2011; Filoche 2012). Initially, the object of criticism was the near impossibility of accessing GRs but this argument lost its strength as the state progressively and silently loosened its grip and Brazilian researchers secured preferential access to them. Soon after CGEN became operative, the Brazilian Institute for the Environment and Renewable Natural Resources became responsible for considering applications to access GRs for non-commercial purposes and it not only issued a large number of authorisations, but also 'special dispensations' for Brazilian public research institutes (Filoche 2012). Other state agencies got increasingly involved in issuing GRs authorisations, totaling around 1,300 in 2013, of which nearly half was for research purposes (Gross 2014: 23). In light of this shift, criticism moved to the manner in

which Brazil's IP system forbade Brazilian researchers and companies to patent inventions based on the nation's biodiversity, whereas foreign companies – whose access remains conditional on formal cooperation with a national entity – could nevertheless do so in countries where it was possible, e.g. the US (Octaviani 2010). In such framing, widely supported by the nascent (private) biotech sector, concerns about loss of competitiveness gained more strength by virtue of appearing simultaneously as a fight against biopiracy.

Following targeted state support for the sector since 2003, and despite the fact that the sector is largely controlled by foreign companies, the number of private Brazilian biotech companies grew, especially in areas of human health and agriculture (Biominas 2011). As the first decade of 2000s was coming to a close, these companies, supported by some Brazilian scientists, sought to rectify limitations on life-patenting in Brazil's IP law.[27] Unlike most developed and ambitious developing countries (e.g. India), Brazil's 1996 IP law does not allow patents on naturally-occurring life forms such as gene sequences and microorganisms, unless modified by human intervention. This was largely the outcome of contests over 'life-patenting' during the 1990s that had brought together in opposition a wide coalition of groups including environment NGOs, trade unions, scientific institutes and the Catholic Bishops Conference (Shadlen 2017). Widespread concerns that the national biotech sector was not strong enough to compete with foreign companies who would, in turn, appropriate Brazil's GRs through patenting were also key in the opposition movement carrying the day (Filoche 2012). Similar concerns also guided state's position on GM seeds during the late 1990s: transgenic research was permitted as a means of supporting Brazilian scientific competitiveness, but GM planting was not, with a view to allowing time for Brazilian agro-biotech firms to develop their own seed varieties and competitive strengths (Jepson 2002). Following the entry of Monsanto into the Brazilian seed market in 1998, a trenchant battle over GM would sweep across state agencies, the judiciary, civil society groups and farmers until hopes for a GM-free Brazil were effectively buried in 2005; since then, over 28 GM varieties of soybean, cotton and corn have been approved, making

Brazil the second largest producer of GM soya worldwide by 2011 and the developing country with the largest GM crop area in the world by 2015 (Peschard 2012; James 2015).

The international success of Brazil's agricultural sector threw an unexpected spanner in the work Brazil had done, alongside India and South Africa, in getting the Nagoya Protocol off the ground at the CBD. Following the 2000 Provisional Measure, a number of resolutions and clarifications on the part of CGEN regarding prior informed consent, access permits, benefit-sharing requirements and, as Brazil had been demanding internationally, mandatory origin disclosure for GRs relevant to patent applications, had set up a national – if, as seen by many, cumbersome – ABS system. Despite such a system, many in Brazil were unsupportive of ratifying the Nagoya Protocol until a more effective national ABS system was put in place (Alisson 2015). Attempts to create a new Biodiversity Law on the part of the executive branch since 2009, however, were repeatedly resisted by agribusiness interest groups, supported by the influential *bancada ruralista* in Congress and the Ministry of Agriculture, largely on the grounds that ABS rules – national and, through the Nagoya Protocol, international – may lead to claims of benefit-sharing for GRs on which Brazil's agribusiness success is built, the vast majority of which (e.g. soy, sugar, microorganisms used in the food and biofuel sector etc.) are not native to Brazil.[28] Although the new Biodiverisity Law that finally passed in 2015 swung the pendulum unmistakably in favour of those in the business of manipulating GRs as compared to the earlier Provisional Measure, it did not alleviate agribusiness concerns, while exacerbating those of indigenous communities who continue to resist its implementation (Welch 2015). Hopes that it would finally open the way to Brazil ratifying the Nagoya Protocol remain unfulfilled, while the corruption scandals that have rocked the new Brazilian government have seemingly put such hopes even further out of reach.

4. Concluding thoughts

It would not be an exaggeration to argue that there exists an international system for access and benefit-sharing related to GRs today due to the efforts of key developing countries, India and Brazil most notable among them. Taking a leaf from the negotiating rulebooks of their more economically-advanced counterparts, this international system of rules has developed into a regime complex, with the WTO, CBD and WIPO currently the most important fora. Not only are the 'regime-shifting' strategies of India, Brazil and, more recently China, in this area of governance similar to those of developed countries, but the ABS rules pertaining to GRs can hardly be said to offer a radically different paradigm of governing GRs to that preferred by developed countries. As noted, there are no disputes over the principle of access to and commodification of GRs: on this fundamental issue, developing countries were active rule-takers in the 1980s and 1990s. The main exception that emerged post-CBD relates to the issue of benefit-sharing from utilisation of GRs; as our analysis of China, India and Brazil suggests, the abandonment of the 'common heritage' principle, the acceptance of the principle of GR commodification/utilisation and efforts to create an international ABS regime have little to do with lack of alternatives than with a drive – differently expressed in the three countries – to accrue rents from the possession of GRs and develop in time domestic biotech sectors capable of competing in world markets. In all these respects – apart from the 'common heritage' principle that clearly benefitted developed countries – these emerging economies' participation in GR governance is not driven by fundamentally different principles to their more advanced counterparts, suggesting that they have no intention of radically changing the constitutive rules of global governance, but primarily making it work in their favour.

We have seen that, at a basic level, it has been this concern with their competitive position in global markets in general and of their biotech sectors in particular that has shaped these countries' participation in the governance of GRs, especially that over ABS rules. This preoccupation with international competitiveness has also been accompanied by the urgency of rectifying the injustices if not of colonial than of neo-colonial expropriation through changing those principles and rules of global GR governance that are perceived to have facilitated such

expropriation, e.g. the principle of 'common heritage of mankind' and the absence of ABS rules for GR utilisation. It is tempting to suggest that the recent activism and relative success on the part of China, India and Brazil in this area of global governance is strictly related to their new-found status as emerging powers; our reason for embedding the analysis in a historical perspective was precisely to show that India and Brazil, at least, have been seen as leaders of the developing world in this area since the 1950s despite their relatively more modest economic weight compared to today. The outcomes of their efforts in changing the rules of international policy regimes in the past and present cannot be evaluated simply by the rather crude indicator of rising economic weight, but rather by paying attention to the changing dynamics in the global economy – e.g. the further opening of global markets, the rise of the competitiveness state orientation, the increased commodification of knowledge (IP) and the emergence of biotech as a new technological and wealth frontier – and to the manner in which these ever-changing dynamics combine with domestic pressures to generate specific position, strategies, coalitions and outcomes rather than others.

It is this mode of investigation that led us to attempt to uncover some of the main domestic pressures and conflicts that have shaped these countries' position in GRs governance. In the case of China, we saw that such pressures stem primarily from the peculiarities of its polity. Paradoxically for what is often seen as a centralised system, a multiplicity of actors at the central level and the local level for a long time effectively blocked the emergence of a nation-wide ABS system in China. Decisive action on the part of highest echelons of the central government opened the way for the ratification and the Nagoya Protocol and, with it, for a more systematic approach to ABS building upon some of the existing pilot cases. Access to and utilisation of China's GRs is likely to remain tightly controlled by the state for some time to come; the importance of the biotech and traditional medicine sectors and fears of GRs misappropriation will likely support this stance in the future which, in turn, may see China becoming more assertive internationally and bilaterally on GRs contests.

In India, indignation against neocolonialism and biopiracy runs deeper still; this has allowed the state to frame its approach to GRs and ABS rules as a tool of dealing with foreign misappropriation of India's GRs, but it has not given it an altogether easy ride. Domestic opposition from environmental and other social groups has been temporarily overcome by the centralisation of biotechnology policies in central state agencies many of which, at the same time, have emerged as the most active players in the biotech and IP markets. The view and rights of indigenous/traditional communities have been largely ignored, unless the documentation of GRs and traditional knowledge associated with them in digital libraries is seen as something more enlightened than the significant extension of state's control over them. Although arguably they lost much in the 2015 Biodiverisity Law, many of Brazil's indigenous groups have by all accounts mounted a much stronger resistance against not only specific ABS terms, but against the idea of the commodification of GRs and traditional knowledge itself. Brazil has sometimes expressed concerns about the negative effects that may arise from such commodification in international fora, but for the most part it has distinguished itself as one of the leading supporters of biotechnology and of the Nagoya Protocol, even if it has yet to ratify the latter.

It is difficult to ascertain what may happen in the future in this area of global governance. For now, it appears that China, India and Brazil have developed domestic systems regarding the utilisation of GRs that, although they inevitably bear the peculiarities of the socio-politico-economic contexts to which they belong, could still provide the basis for continued collaboration in international GRs contests in the near future. If future ABS international instruments continue to provide leeway for domestic implementation, as it is highly likely, the differences of their domestic GR and ABS approaches should not provide cause for coalition splits. Homologating TRIPS and CBD via a TRIPS amendment is a much tougher call, not least because of the resistance of the US and some other key developed counterparts. It may prove to be the case that, if China, India and Brazil succeed in developing competitive biotech sectors of their own, they may become less concerned about GR disclosure of origin in patent

applications, especially if their own biotech companies find this request cumbersome. Likewise, it may also become less important if technological change makes access to GRs on the ground less relevant in the near future.

Notes

[1] See United Nations Environmental Programme: http://www.biodiversitya-z.org/content/megadiverse-countries, last accessed on 17 May 2017.

[2] Traditional knowledge encompasses much more than knowledge associated with the use of genetic resources; it generally refers to know-how, skills and practices that are developed and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity.

[3] Indeed, they go back much further; although it is during the mid-20th century that issues pertaining to access to GRs and IP made a joint-entry into international policy regimes, they became inextricably linked from the 1500s onwards. A core feature of human history, the movement of plant genetic resources changed substantially with the rise of European colonialism and, especially, with the Great Columbian Exchange between the 'New' and 'Old' worlds from the early 1500s onwards.

[4] See FAO Resolutions 4/98, 5/98 and 3/91 at http://www.fao.org/Ag/cgrfa/iu.htm, last accessed on 25 January 2017.

[5] Apart from the fora discussed here, developing countries had been raising the issue of GRs in other international fora. Important among them was the conclusion of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRA) at FAO in 2001. Brazil and India (China remains outside the treaty) alongside countries such as Mexico played a central role in securing a treaty that provides multilateral access to a wide repository of agricultural GRs. Just as the latter is crucial to avoiding diseases affecting agricultural produce due to the extremely narrow genetic material used in global food production currently, access to new, ever-mutating pathogens is crucial to effectively responding to epidemics. But, as in the case

of the SARS epidemics, developing countries like China, Indonesia and others who had deposited pathogen strains at the WHO in line with international practices, saw no benefits from making available these GRs and threatened to withhold pathogen strain sharing in the future.

[6] For some early discussions along these lines see, for instance, communications from Brazil IP/C/W/228 (2000); **"**The Relationship Between the TRIPs Agreement and the CBD and the Protection of Traditional Knowledge" submitted on behalf of China, Cuba, Dominican Republic, Ecuador, India, Pakistan, Peru, Thailand, Venezuela, Zambia and Zimbabwe, IP/C/W/356 (2002); submission by India IP/C/W/195 (2000) and Mauritius on behalf of the African Group IP/C/W/206 (2000).

[7] See, for instance, India's communications to the WTO, IP/C/W/161, WT/CTE/W/156 and IP/C/W/195 and in 1999 and 2000.

[8] Thanks to the spread of Western IP norms, not least via TRIPS, the three criteria of patentability are that the invention be novel, non-obvious/involve an inventive step and be capable of industrial application.

[9] These negotiations culminated with the Nagoya Protocol on Access and Benefit Sharing in 2010; in force since 2014.

[10] Interview, two participants of the Mexican delegation to the Nagoya negotiations. Mexico City, 14. April, 2014.

[11] See the *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity*, available at https://www.cbd.int/abs/about/, last accessed on 25 January 2017.

[12] For a recent reiteration of these positions, see ICTSD Bridges 9 June 2016 "WIPO Committee Advances Working Document on Genetic Resources, Though Divisions Remain", available at http://www.ictsd.org/bridges-news/bridges/news/wipo-committee-advances-working-document-on-genetic-resources-though, last accessed on 24 January 2017.

[13] The idea of pushing for a WIPO diplomatic conference was proposed by the Like-Minded Group (LMG) in a Bali meeting in June 2011.

[14] See http://www.wipo.int/export/sites/www/about-wipo/en/assemblies/pdf/2017_list_of_decisions.pdf, (p.11). Last accessed on 10th May 2018.

[15] Interview, high-ranking Indian official, participant of CBD and TRIPS negotiations. New Delhi, 16 January 2012.

[16] Interview, high-ranking Indian official, participant of CBD and TRIPS negotiations. New Delhi, 16. January 2012.

[17] One of the most high-profile partnership of the latter type was that between Monsanto and the Hebei Provincial Seed Company on Bt cotton (Huang *et al*., 2002). Large Chinese state-owned enterprises have more recently sought to expand internationally through M&As, of which the largest was the acquisition of Syngenta for 44 billion USD by ChemChina.

[18] Tu Youyou received the Nobel Prize in Medicine in 2015 for her work on artemisinin, which she considered a gift of traditional Chinese medicine for the world.

[19] According to a senior Chinese economist involved in these negotiations, China is also making use of bilateral free trade agreements to extend the protection and export success of the traditional medicine sector (Interview, Beijing 12 May 2017). The ongoing discussions of these issues in an effort to deepen the Sino-Swiss FTA is a case in point.

[20] Two interviews with Mexican negotiators involved in the CBD and other ABS negotiations. Mexico City, 8 April 2014. Additionally, interview with Indian diplomat involved in ABS negotiations, New Delhi, 16. January 2012.

[21] Geographical Indications are a new form of IP; they are signs used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin, e.g. Switzerland's Gruyère cheese, Mexico's Tequila etc.

[22] See Foreign Economic Cooperation Office: https://www.cbd.int/business/nri/china.shtml, last accessed on 29 December 2016.

[23] This important new initiative includes twelve departments of both the Central Committee and the State Council and has been overseen by the Leading Group on Financial and Economic Affairs headed by president Xi Jinping himself. See: China's New Blueprint for an 'Ecological

Civilization', available at: http://thediplomat.com/2015/09/chinas-new-blueprint-for-an-ecological-civilization/, last accessed on 18 January 2017.

[24] This group included L. K. Jha, Abid Hussain, Shankar Acharya, Montek Singh Ahluwalia and the long-serving PM Manmohan Singh.

[25] Interview, representative WIPO's regional office, Rio de Janeiro, 13 August 2014.

[26] The contract in question was a joint venture between Bioamazônia and the pharmaceutical multinational Novartis in which the latter would claim all IP titles that could be realised by the bio-prospecting project under contract, while Bioamazônia was only entitled to 1% of subsequent royalties and an upfront payment of US$ 4 million (Coutinho *et al.* 2001)

[27] These efforts are still ongoing and have not yet produced any noticeable change.

[28] Interview, Official of the Ministry of Agriculture, Brasilia, 8 July 2013; Interview, Official of the Brazilian Environmental Ministry, Brasilia, 6 August 2014.

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